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MORRISON & FOERSTER LLP
755 PAGE MILL RD
PALO ALTO, CA 94304-1018

| EXAMINER | |
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| LEUNG, JENNIFER A | |
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**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

| Office Action Summary | Application No. | Applicant(s) | |
|---|---|---|---|
| | 09/553,990 | XU ET AL. | |
| | Examiner | Art Unit | |
| | Jennifer A. Leung | 1797 | |

*-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --*

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

1)☒ Responsive to communication(s) filed on *12 September 2007*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

4)☒ Claim(s) *1-3,6-11,14-27,30-35,38-40 and 49-58* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-3,6-11,14-27,30-35,38-40 and 49-58* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

**Application Papers**

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Jennifer A. Leung

**Attachment(s)**

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

## DETAILED ACTION

### *Continued Examination Under 37 CFR 1.114*

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on September 12, 2007 has been entered.

Claims 4, 5, 12, 13, 28, 29, 36, 37 and 41-48 are cancelled. Claims 1-3, 6-11, 14-27, 30-35, 38-40 and 49-58 are currently active.

### *Claim Rejections - 35 USC § 103*

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

2. Claims 1-3, 6, 7, 9-11, 14, 15, 17-23, 25-27, 30, 31, 33-35, 38, 39, 49-51 and 54-57 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kmecak et al. (EP 0 171 460) in

view of Williams (US 4,422,925).

Regarding claims 1, 17, 20, 21 and 25, Kmecak et al. (see FIG. 8; generally, page 38, line 13 to page 41, line 20) discloses a riser reactor and a corresponding process of conducting a hydrocarbon cracking reaction in the riser reactor, wherein the riser reactor (i.e., including portions **1** and **2**), having a riser reactor height and a reactor bottom, comprises, in order from the reactor bottom,

a) a prelift zone (i.e., the restricted diameter portion of the riser **1**, located between the lift gas inlet conduit **4** and the charge oil inlet conduit **5**) having a prelift zone diameter and a prelift zone height and containing catalyst cracking catalyst (i.e., a cracking catalyst, introduced in regenerated form via conduit **3**; page 43, lines 7-26; also, page 14, line 3 to page 17, line 23), the prelift zone being adapted to lift the catalyst to a first reaction zone (i.e., located immediately downstream from inlet **5**) without cracking hydrocarbons in that prelift zone (i.e., the lift gas to the inlet conduit **4** for contacting the regenerated catalyst is a dry hydrogen containing gas, optionally supplemented with steam and/or water, and most preferably containing about 0-6% C3-plus hydrocarbons. Such contact is conducted prior to contacting the regenerated catalyst with heavy oil feed supplied via conduit **5** to be cracked. See page 28, lines 9-25; page 44, line 12 to page 46, line 2);

b) the first reaction zone (i.e., the restricted diameter portion of the riser **1**, located between the charge oil inlet conduit **5** and the frusto-conical transition section to portion **2**, not labeled) having a constant first reaction zone diameter and a first reaction zone height, the first reaction zone containing catalytic cracking catalyst lifted from the prelift zone and reacting a hydrocarbon (i.e., received from the charge oil inlet **5**) in the first reaction zone; and

c) a second reaction zone (i.e., the expanded or larger diameter portion of the riser **2**) having a second reaction zone diameter that is larger than the first reaction zone diameter and containing catalytic cracking catalyst and reacted hydrocarbons from the first reaction zone.

The prelift zone (i.e., riser **1**, between inlets **4** and **5**) and first reaction zone (i.e., riser **1**, between inlet **5** and the transition) are defined by the same riser reactor portion **1**, and therefore, the ratio of the first reaction zone diameter to the prelift zone diameter is approximately 1:1.

Additionally, Kmecak discloses that the diameter of the second reaction zone **2** is expanded or larger than the diameter of the first reaction zone **1** (see FIG. 8; also, see page 27, lines 4-15; page 40, lines 3-8). Kmecak, however, does not state a specific diameter ratio for the second reaction zone **2** diameter to the first reaction zone **1** diameter.

Also, from FIG. 8, it appears that the height of the first reaction zone **1**, between inlet **5** and the transition, is about 30% the height of the riser reactor, and the height of second reaction zone **2** is about 50% of the height of the riser reactor. Kmecak et al., however, does not state that FIG. 8 is to scale, and does not indicate a specific height of the first reaction zone or a specific height of the second reaction zone **2**, relative to the height of the riser.

In any event, it would have been obvious for one of ordinary skill in the art at the time the invention was made to select the recited dimensions for each of the prelift zone, the first reaction zone and the second reaction zone in the riser reactor of Kmecak et al., on the basis of suitability for the intended use, because changes in size merely involves routine skill in the art, *In re Rose*, 220 F.2d 459, 463, 105 USPQ 237, 240 (CCPA 1955). Additionally, the precise dimensions of the respective zones of the riser reactor would have been considered a result effective variable by one having ordinary skill in the art, as evidenced by Williams. In particular, Williams et al.

(column 4, lines 21-29) teaches a riser reactor wherein,

> "In each of the reactor sections **9**, **10**, **11** and **12**, reaction conditions suitable for substantially optimum conversion of the various hydrocarbon feedstreams introduced into the successive sections of the riser reactor to the desired products may be obtained by variations in vapor velocity, catalyst loading, feed preheats, and regenerator temperature. *The length and diameter of the various sections of reactor* ***2*** *are proportioned to maintain a desired reaction time in each section.*"

Accordingly, one having ordinary skill in the art would have routinely optimized the length and diameter of the various zones of the riser in the apparatus and process of Kmecak et al. in order to obtain the desired reaction conditions within each zone for achieving an optimum conversion of a specified hydrocarbon feed to the desired cracked products, *In re Boesch*, 617 F.2d. 272, 205 USPQ 215 (CCPA 1980), and where the general conditions of a claim are disclosed in the prior art, discovering optimum or workable ranges involves only routine skill in the art. *In re Aller*, 105 USPQ 233.

Regarding claims 2, 18 and 26, Kmecak et al discloses the riser reactor may comprise a vertical length of about 49 meters, or about 160 feet (page 49, lines 7-23). Additionally, Kmecak et al. discloses, "The riser reactor may be substantially any desired vertical length which will be compatible with the adjacent catalyst regeneration apparatus..." (page 41, lines 15-20).

Regarding claims 3, 19 and 27, in FIG. 8, it appears that the prelift zone **1** height, between inlet conduits **4** and **5**, is about 10% of the height of the riser reactor. Kmecak, however, does not state that the figures is to scale, and does not indicate a specific height of the prelift zone relative to the height of the riser. In any event, it would have been obvious for one of ordinary skill in the art at the time the invention was made to select appropriate dimensions for the prelift zone in the riser reactor of Kmecak et al., on the basis of suitability for the

intended use and absent showing any unexpected results thereof, because the precise dimensions would have been considered result effective variables by one having ordinary skill in the art, as evidenced by Williams et al (see comments above). Accordingly, one having ordinary skill in the art would have routinely optimized the diameter and height of the prelift zone relative to the dimensions of the riser reactor in the apparatus and process of Kmecak et al. in order to obtain the desired reaction conditions and reaction time within the system for achieving an optimum conversion of a specified hydrocarbon feedstream, *In re Boesch*, 617 F.2d. 272, 205 USPQ 215 (CCPA 1980), and it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. *In re Aller*, 105 USPQ 233.

Regarding claims 6, 22 and 30, Kmecak et al. discloses an outlet zone having a height of 0% of the riser reactor height. Thus, a specific diameter for the outlet zone is not applicable.

Regarding claims 7, 23 and 31, Kmecak et al. further discloses, in FIG. 8, a first junction section (i.e., the frusto-conical transition zone, not labeled) between the first reaction zone (i.e., the riser **1** portion, above inlet **5**) and the second reaction zone (i.e., riser **2** portion), wherein the first junction section forms a circular truncated cone shape. Kmecak, however, does not specifically state that the first junction section has a "vertical section vertex angle" in the range of about 30° to 80° within the specification. In any event, it would have been obvious for one of ordinary skill in the art at the time the invention was made to select an appropriate vertex angle for the first junction section in the apparatus and process of Kmecak et al., on the basis of suitability for the intended use and absent showing any unexpected results thereof, because the precise angle would have been considered result effective variable by one having ordinary skill

in the art. Accordingly, one having ordinary skill in the art would have routinely optimized the vertex angle of the first junction section relative to the dimensions of the first and second reaction zones in the apparatus and process of Kmecak et al., in order to obtain the desired reaction conditions and reaction time within the system for achieving substantially optimum conversion of a specified hydrocarbon feedstream, *In re Boesch*, 617 F.2d. 272, 205 USPQ 215 (CCPA 1980), and it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. *In re Aller*, 105 USPQ 233.

Regarding claims 9, 14, 33 and 38, the same comments with respect to Kmecak et al. and Williams et al. apply. Kmecak et al. further discloses an outlet zone having a height of 0% of the riser reactor height. Thus, a specific diameter for the outlet zone is not applicable. Furthermore, the first reaction zone of Kmecak et al. will be inherently capable of being configured so that a hydrocarbon cracking reaction takes place at a higher reaction temperature, higher ratio of catalyst to oil, and shorter reaction time than, respectively, a reaction temperature, ratio of catalyst to oil, and a reaction time of the second reaction zone, by virtue of the placement of the feedstock inlet 5, catalyst inlet **3**, the relative reaction zone heights, and enlarged second reaction zone **2** diameter with respect to the first reaction zone **1** diameter (see FIG. 8).

Regarding claims 10 and 34, the same comments with respect to Kmecak et al. apply. (see comments made regarding claims 2, 18 and 26 above).

Regarding claims 11 and 35, the same comments with respect to Kmecak et al. and Williams et al. apply. (see comments made regarding claims 3, 19 and 27 above).

Regarding claims 15 and 39, the same comments with respect to Kmecak et al. apply.

(see comments made regarding claims 7, 23 and 31 above)

Regarding claims 49-51, 56 and 57, Kmecak et al. further discloses a conduit (i.e., inlet **7** or **8**; FIG. 8) adapted to supply a quenching medium or a reactable feedstock (i.e., residual oil feed via inlet 7; steam and/or water introduced as diluent via inlet **8**; page 40, line 1 to page 41, line 6) between the first reaction zone (i.e., the riser **1** portion, between inlet **5** and the transition) and the second reaction zone (i.e., the riser **2** portion). The quenching medium inlet inherently functions as a heat exchanger in the second reaction zone **2**, for cooling at least a portion of hydrocarbon and catalyst passing from the first zone to the second zone.

Regarding claim 54, Kmecak et al. further discloses a conjunct zone (i.e., the frusto-conical transition zone, not labeled, see FIG. 8) between the first reaction zone (i.e., the riser **1** portion, above inlet **5**) and the second reaction zone (i.e., riser **2** portion).

Regarding claim 55, Kmecak et al. further discloses a conduit (i.e., inlet **9** or **10**; FIG. 8). adapted to introduce quenching medium (i.e., residual oil feed via inlet **9**; steam and/or water introduced as diluent via inlet **10**; page 40, line 1 to page 41, line 6) between the second reaction zone **2** and the outlet zone.

3. Claims 8, 16, 24, 32 and 40 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kmecak et al. (EP 0 171 460) in view of Williams (US 4,422,925), as applied to claims 1, 9, 17, 25 and 33 above, and further in view of Watts (US 2,377,657).

Kmecak et al. is silent as to the riser reactor being configured with an outlet zone and a second junction section located between the second reaction zone **2** and the outlet zone, wherein the second junction section has a circular truncated cone shape. Watts (see FIG. 1) teaches a riser reactor **11** comprising an outlet zone (i.e., the upper narrowed portion of reactor **11**) and a

conjunct section (i.e., labeled as false head **16'**) located between the outlet zone and a reaction zone, wherein the outlet zone has a circular truncated cone shape (page 2, column 2, lines 49-66). It would have been obvious for one of ordinary skill in the art at the time the invention was made to modify the riser reactor of Kmecak et al. to comprise an outlet zone and second junction zone, on the basis of suitability for the intended use thereof, because, "When the diameter of the reactor is narrowed at its upper end and a false head **16'** is adjustably supported therein, the effective volume of the catalyst chamber, i.e., the dense phase catalyst level therein may be easily controlled," as taught by Watts. Although the collective teachings of Kmecak, Williams and Watts are silent as to the second junction section having a vertical section vertex angle with respect to the reactor axis in the range of about 45 to 80 degrees, it would have been obvious for one of ordinary skill in the art at the time the invention was made to select an appropriate vertex angle for the second junction section in the modified apparatus and process of Kmecak et al., on the basis of suitability for the intended use and absent showing any unexpected results thereof, because the precise angle would have been considered result effective variable by one having ordinary skill in the art. Accordingly, one having ordinary skill in the art would have routinely optimized the vertex angle of the first junction section relative to the dimensions of the first and second reaction zones in the modified apparatus and process of Kmecak et al., in order to obtain the desired reaction conditions and reaction time within the system for achieving substantially optimum conversion of a specified hydrocarbon feedstream, *In re Boesch*, 617 F.2d. 272, 205 USPQ 215 (CCPA 1980), and it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. *In re Aller*, 105 USPQ 233.

4. Claims 52, 53 and 58 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kmecak et al. (EP 0 171 460) in view of Williams (US 4,422,925), as applied to claim 1 above, and further in view of Carr et al. (US 3,639,228).

Kmecak et al. is silent as to the quench medium comprising catalyst (e.g., regenerated catalyst with a residual carbon content of less than about 0.1 wt%, semi-regenerated catalyst having a residual carbon content of at least 0.1 wt% to about 0.9 wt%, or fresh catalyst). Carr (FIG. 1) teaches the introduction of catalyst at various locations (i.e., via catalyst pipes **18** and **20**) downstream from the inlet of the reactor (i.e., adjacent catalyst inlet **16**). The catalyst may comprise regenerated or semi-regenerated catalyst (i.e., regenerated catalyst with a level of carbon on the regenerated catalyst from about 0.05 to 0.3 percent by weight; column 5, lines 34-59), as well as fresh catalyst (i.e., supplied via make-up catalyst line **66**). It would have been obvious for one of ordinary skill in the art at the time the invention was made to provide a quenching medium comprising catalyst to the riser reactor in the modified apparatus of Kmecak et al., on the basis of suitability for the intended use thereof, because the downstream injection of additional catalyst increases the yield and selectivity of the cracking reaction within the riser reactor by shifting a major portion of the cracking reaction away from the inlet end of the reactor and thereby distributing the cracking reaction over the length of the riser rather than concentrating the reaction at the inlet of the riser, as taught by Carr et al. (column 1, lines 33-73).

***Response to Arguments***

5. Applicant's arguments filed September 12, 2007 have been fully considered but they are not persuasive. Beginning at page 12, last paragraph, Applicant argues,

> "...It is well established that one cannot measure features depicted in a figure and assert that the proportions that are based solely on those measurements are accurate ... To

> Applicants' knowledge, Kmecak et al.'s specification is completely silent on dimensions or scale that might permit one to measure features in the figures and draw conclusions on proportions based on those measurements. Likewise, Williams is silent on relevant dimensions that might be useful in construing Figure 8 of Kmecak et al. Consequently, any rejection based on measurements of the figures does not establish sufficient information to assert that the claimed subject matter is obvious."
>
> "The Office has also asserted that Williams supplies the necessary information to conclude that the claims are obvious even if the dimensions of Kmecak et al. were not exactly precise. The Office's argument still assumes that some conclusion may be drawn from dimensions of features illustrated in Kmecak et al.'s Figure 8, even the if dimensions are not entirely precise. However, as noted above, no conclusions may be drawn on proportions from a figure where the specification is silent on the dimensions. Consequently, even if Williams suggested minor variations from what Kmecak et al. taught, Kmecak et al.'s Fig. 8 teaches nothing about dimensions or proportions to optimize."

Applicant's argument is not persuasive.

As indicated in the rejection above, the Examiner understands that the proportions of features in a drawing are not evidence of actual proportions, when drawings are not to scale. Hence, the secondary reference to Williams was relied upon to teach the obviousness in changing the dimensions of length and diameter of a particular reaction zone of a riser reactor, in order to establish the desired reaction conditions, e.g., residence time, within each zone, for achieving an optimum conversion of a specified hydrocarbon feedstock into the desired products.

Although Kmecak may not specify the "precise" dimensions of each of the zones within the riser reactor, the description of the article pictured can be relied on, in combination with the drawings, for what they would reasonably teach one of ordinary skill in the art. *In re Wright*, 569 F.2d 1124, 193 USPQ 332 (CCPA 1977).

For example, Kmecak discloses that the riser comprises a larger diameter second reaction zone **2** relative to the first reaction zone (see page 27, lines 4-15; page 40, lines 3-8). Also, the riser may comprise a vertical length of about 49 meters, or any desired vertical length; the riser may contain a catalyst suspension with a velocity in the range of 19 to 31 meters/sec; and the riser may provide a residence time of about 2 seconds, a prelift zone residence time of a fraction of a second up to 0.5 seconds, and a hydrocarbon residence contact time of up to about 1 or 1.5 seconds (see page 41, second paragraph, and page 49, second paragraph). Kmecak's description, in combination with the pictured riser in FIG. 8, would have suggested to one having ordinary skill in the art a riser reactor generally comprising the various zones being claimed, including a second reaction zone of an enlarged diameter. Furthermore, the disclosure of Kmecak, in combination with the teachings of Williams, would have suggested to one having ordinary skill in the art that the dimensions of the zones in the riser could be varied in order to optimize the reaction conditions, e.g., residence time, within a particular zone, for establishing the conversion of a particular hydrocarbon containing feed stream to the desired products.

Beginning at page 13, third paragraph, Applicant's arguments are made in reference to the declaration filed under 37 CFR 1.132 of Dr. Xu Youhao, on September 12, 2007. The declaration, however, is insufficient to overcome the rejection of claims 1-3, 6-11, 14-27, 30-40 and 49-58 under 35 U.S.C. 103(a) as set forth in the Office action, because the declaration fails to present sufficient facts and reasoning for overcoming the rejection.

Declaration, Item 7.

The declaration states that, "the present invention achieves unexpected technical effects, which can be clearly seen from Example 1 and the corresponding Comparative Example 1, and

Example 2 and the corresponding Comparative Example 2".

The Examiner, however, asserts that the comparison of Examples 1 and 2 with Comparative Examples 1 and 2 is not relevant to the point at issue. While Examples 1 and 2 are riser reactors having a second reaction zone of enlarged diameter relative to the first reaction zone diameter, the Comparative Examples 1 and 2 are both iso-diameter riser reactors.

Applicant has not compared the results of their enlarged diameter riser reactor to the results of another enlarged diameter riser reactor.

Furthermore, the evidence does not show a criticality to the specifically claimed range of 1.5:1 to 5:1 for the second reaction zone diameter relative to the first reaction zone diameter. Declaration, Item 8.

The declaration then attempts to overcome the rejection by showing that it would be impossible to configure the riser reactor of Kmecak to comprise a diameter ratio within the claimed range, according to the calculations beginning at the bottom of page 13.

The Examiner, however, asserts that the calculations provided by Applicant are moot, given that the calculations are based on improper assumptions of the prelift and reaction zone dimensions taken from Kmecak's FIG. 8 (which, as indicated above, is not drawn to scale).

Furthermore, *assuming arguendo* the prelift and reaction zone dimensions as deduced from FIG. 8 were valid, the Examiner asserts that Applicant's calculations are based on improper assumptions on the conditions within the riser. In particular, the declaration (beginning at page 17, last paragraph) states,

> "According to the law of conservation of mass, the mass flowrates at all cross-sections of the riser are equal, and, in terms of Figure 3, the mass flowrate at the inlet of the conjunct section between the first and second reaction zones (shown by the subscript

"1") and the mass flowrate at the outlet of the conjunct section between the first and second reaction zones (shown by the subscript "2") are equal, as shown by the following equation:

$$\rho_2 \times V_2 = \rho_1 \times V_1 \qquad (6)$$

The general knowledge of the principles of catalytic cracking teaches us that the reactions occurring at cross-section "1" and cross-section "2" are basically conversion reactions and cracking does not occur in a large scale. Accordingly, it may be concluded that the number of molecules at said two cross-sections remains unchanged. Since the pressures and temperatures at said two cross-sections do not change much, it may be concluded, on the basis of the density definition, i.e. equation (2), that the densities at said two cross-sections are equal:

$$\rho_2 = \rho_1 \qquad (7)$$

Equation (6) can thus be written as:

$$V_2 = V_1 \qquad (8)$$ ".

The Examiner respectfully disagrees and asserts that assumption (7) would be invalid for a riser reactor having an enlarged second reaction zone diameter.

Specifically, the density $\rho_1$ at the inlet of the conjunct section does not equal the density $\rho_2$ at the outlet of the conjunction section, as evidenced by Sharp et al. (US 3,246,960).

Sharp et al. (see column 5, lines 9-24; with emphasis added) teaches,

"It will be seen from an inspection of the data in FIG. 4 that for each chord, the density was substantially constant throughout the length of the transfer line reactor. Comparing these data with the conventional type of transfer line reactor, it will be seen that substantially uniform cross-sectional densities were obtained in the practice of the present invention; whereas, in practice of the prior art, the densities vary greatly with the various levels. This is particularly striking where the density measurements were taken in the cone portion of the conventional transfer line reactor, showing conclusively that an

upwardly diverging cone does not give results as satisfactory as those obtained with a reaction zone in accordance with this invention, where the cross-sectional diameter of the lower end of the reaction zone is at least as great as the cross-sectional diameter of the upper end."

DENSITIES ACROSS CHORDS IN POUNDS PER CUBIC FOOT

| | CHORD | | | | CHORD | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | A | B | C | D | A | B | C | D | |
| 44 FT. | 7.0 | 4.9 | 4.1 | 3.9 | 6.6 | 4.6 | 3.8 | 3.6 | 44 FT. |
| 34 FT. | 8.2 | 5.4 | 4.3 | 4.1 | 9.9 | 6.4 | 4.9 | 4.4 | 34 FT. |
| 24 FT. | 8.2 | 5.5 | 4.4 | 4.1 | 10.7 | 8.2 | 6.0 | 5.5 | 24 FT. |
| 18.7 FT. | 7.9 | 5.5 | 4.3 | 4.0 | 27.3 | 18.3 | 10.3 | 9.0 | 17 FT. |
| 12 FT. | 9.0 | 6.1 | 5.0 | 4.5 | | | | | |

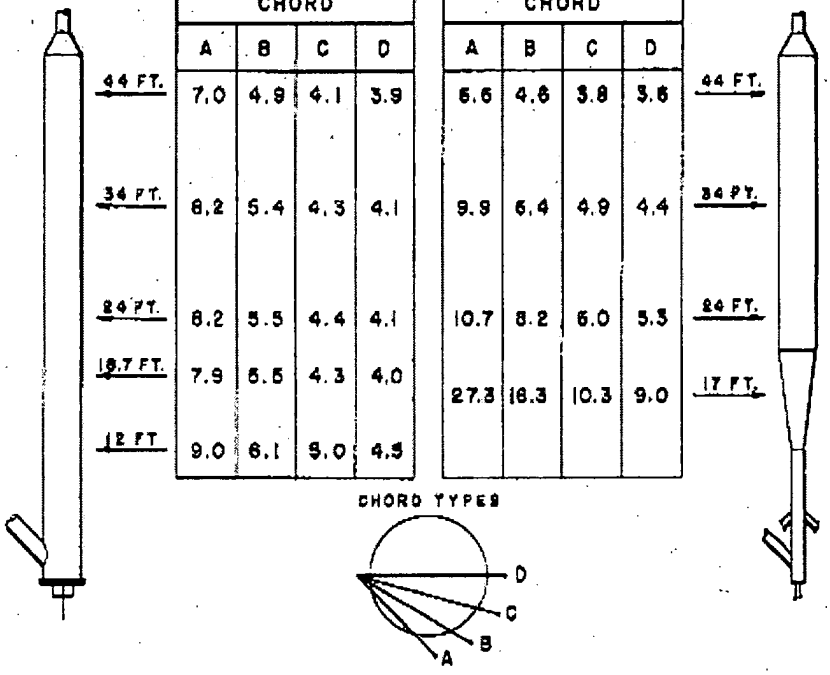


FIG. 4.

Applicant's assumption of $\rho_2 = \rho_1$ may be reasonable with respect to an iso-diametric riser reactor, i.e., the reactor shown on the left in FIG. 4. As suggested in the table, the density across a given chord A-D only varies minimally along the vertical axis of the reactor.

However, one having ordinary skill in the art would clearly recognize Applicant's assumption of $\rho_2 = \rho_1$ to be invalid with respect to a riser reactor having an enlarged second reaction zone diameter, i.e., the reactor shown on the right in FIG. 4. As suggested in the table, the density across a given chord A-D drops significantly from the inlet of the conjunct section to

the outlet of the conjunct section.

Thus, in the case of a riser reactor having an enlarged second reaction zone diameter, it may be properly concluded that,

$\rho_2 \neq \rho_1$

and, in particular,

$\rho_2 << \rho_1$.

Accordingly, Applicant's calculated value of $u_1/u_0 = 18.7$ is clearly incorrect, since the calculations have not accounted for the significant drop in density from the inlet of the conjunct section to the outlet of the conjunct section. The value of $u_1/u_0$ is in fact much smaller than what Applicant has calculated.

In view of the foregoing, when all of the evidence is considered, the totality of the rebuttal evidence of nonobviousness fails to outweigh the evidence of obviousness.

***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jennifer A. Leung whose telephone number is (571) 272-1449. The examiner can normally be reached on 9:30 am - 5:30 pm Monday through Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Glenn A. Caldarola can be reached on (571) 272-1444. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Jennifer A. Leung
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